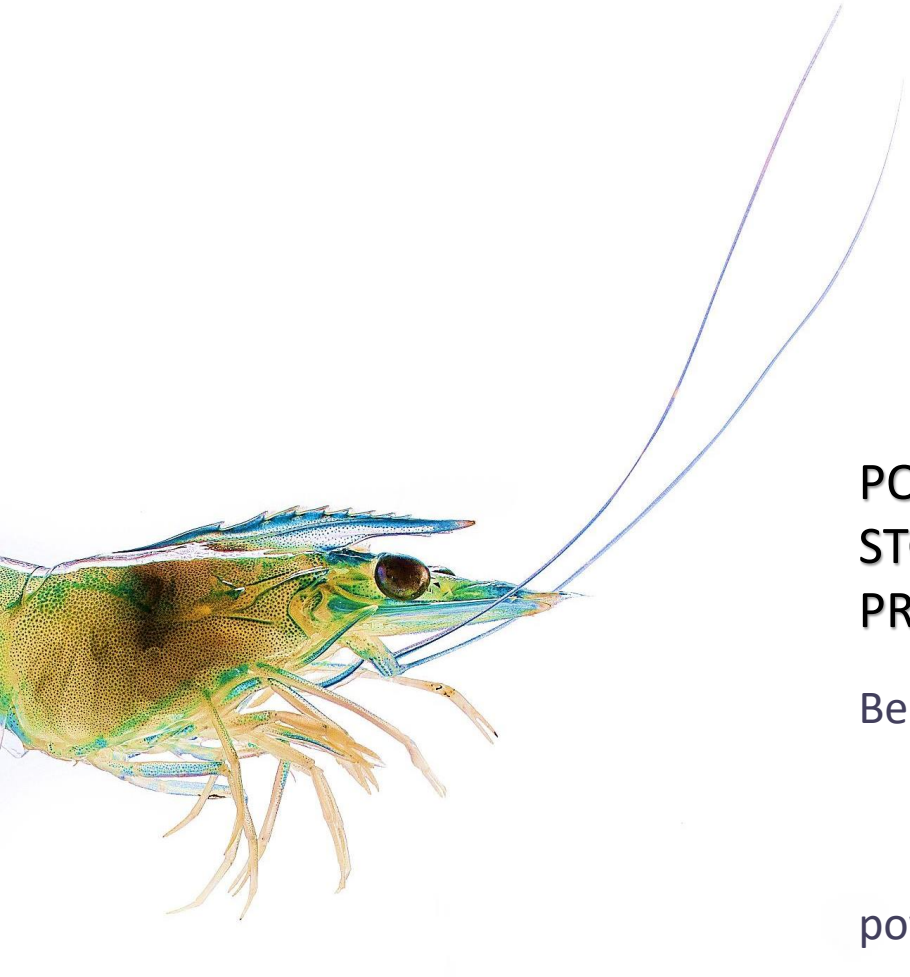

FÖRDE GARNELEN

POST-TRANSPORT ADAPTATION OF PL FOR STOCKING RAS - EXPERIENCES AND PROPOSED BEST PRACTICE

Bert Wecker

powered by neomar


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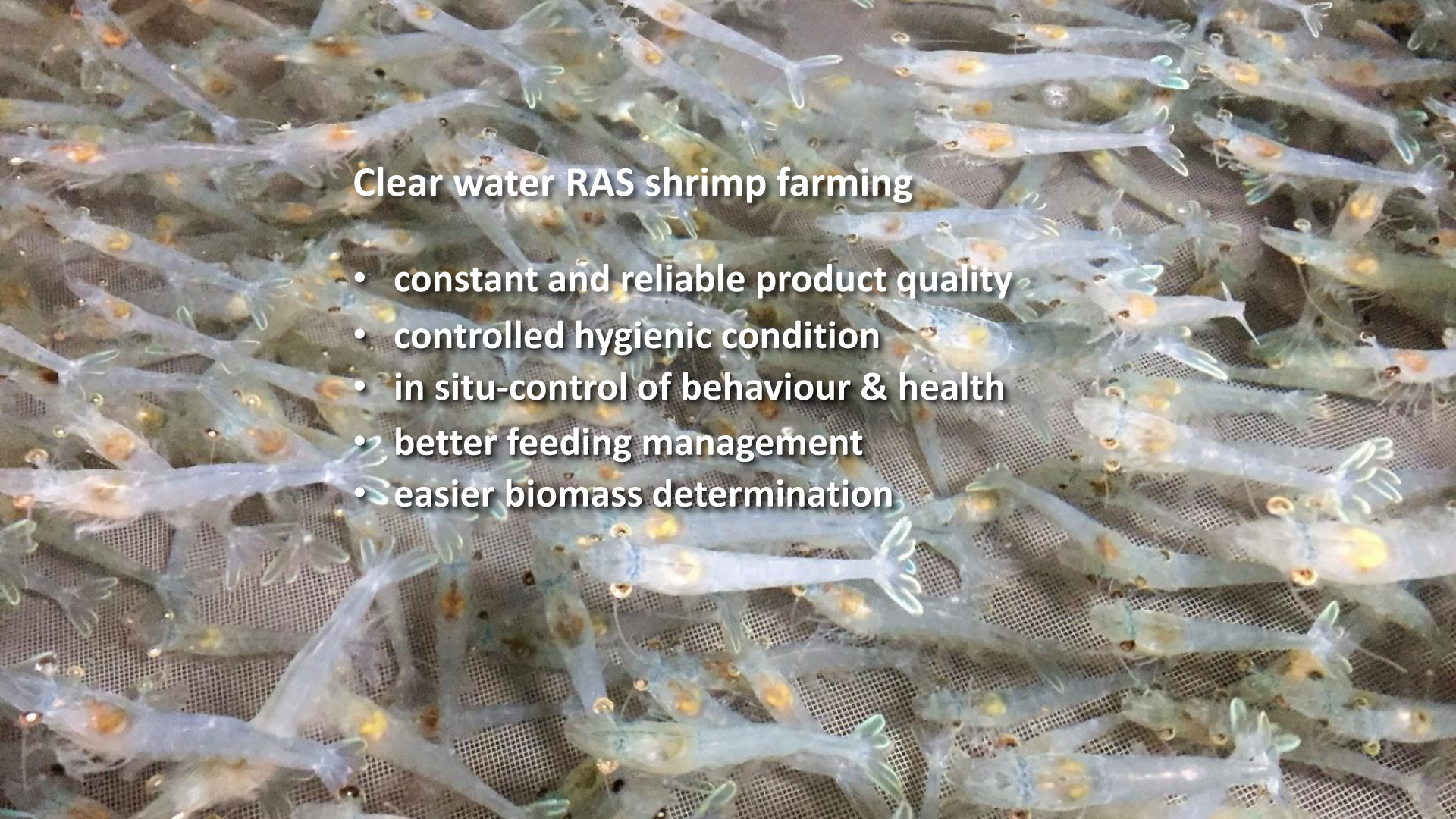
GARNELEN

Sander Group

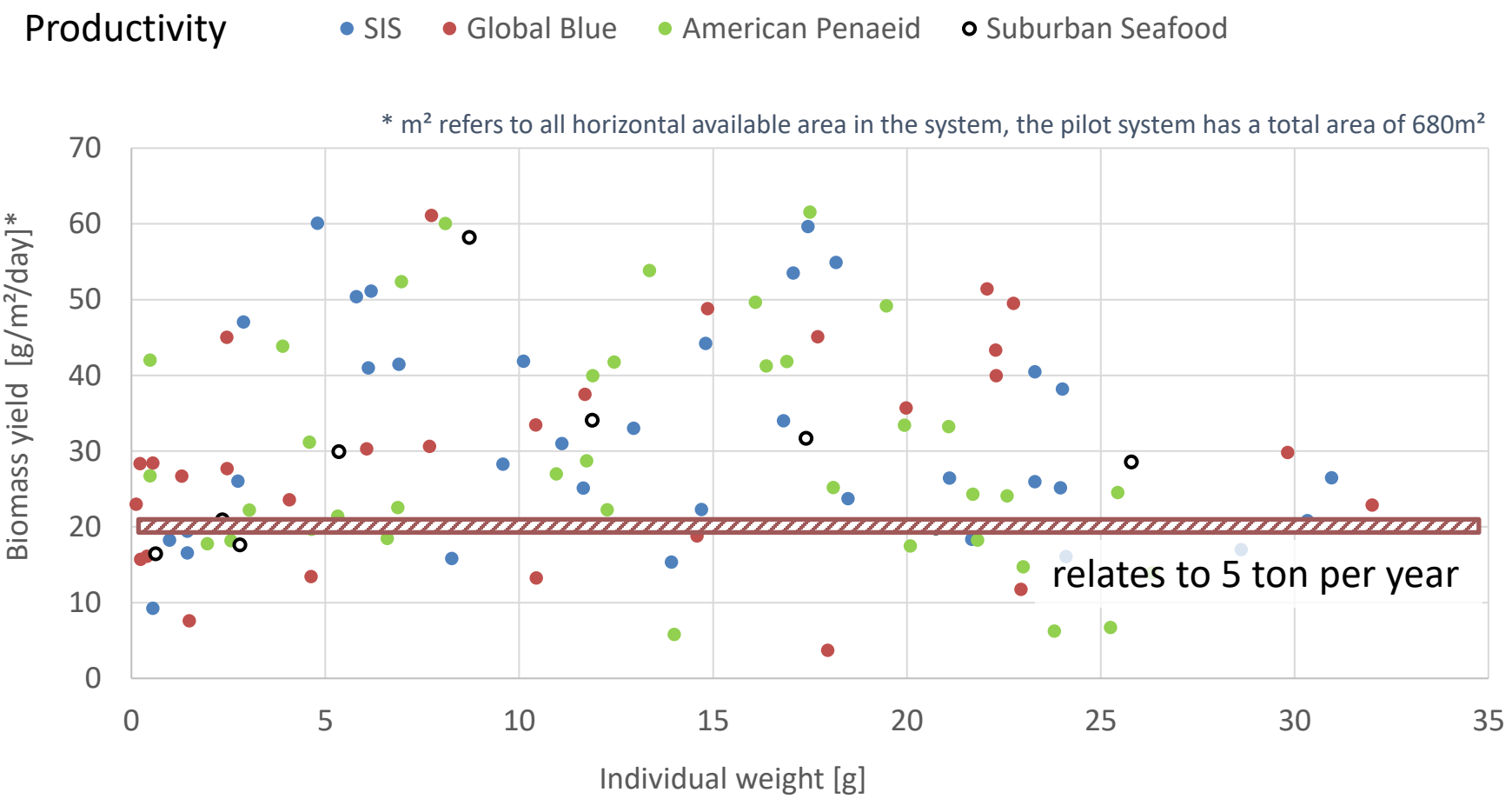

Förde Garnelen, Strande, Germany
Pilotsystem 5 tons per year
2022 new farm 50 tons per year


Pilot system 5 tons per year

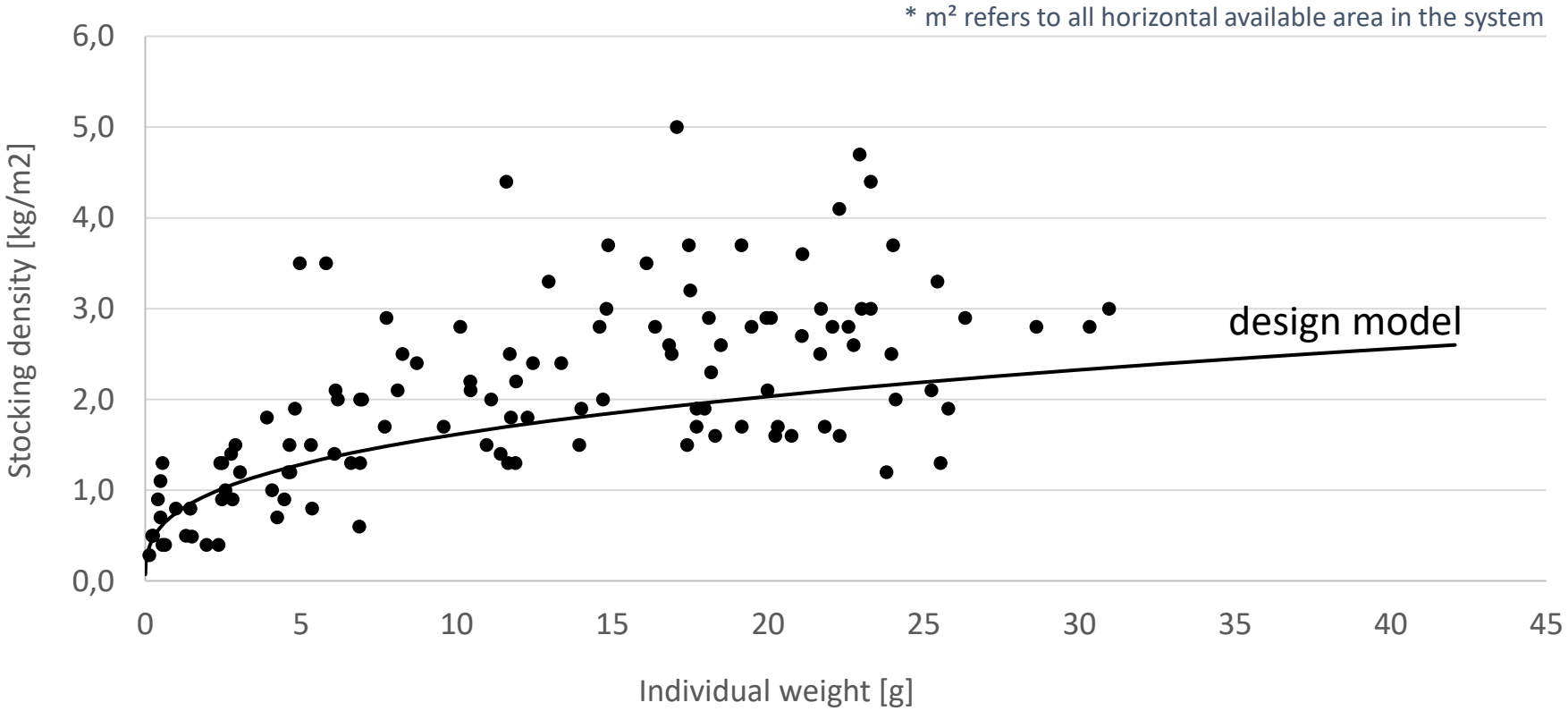


Clear water RAS shrimp farming

- constant and reliable product quality
- controlled hygienic condition
- in situ-control of behaviour & health
- better feeding management
- easier biomass determination


Productivity
SIS
Global Blue
American Penaeid
Suburban Seafood
* m² refers to all horizontal available area in the system, the pilot system has a total area of 680m²
Biomass yield [g/m²/day]*
Individual weight [g]
relates to 5 ton per year
0
10
20
30
40
50
60
70
0
5
10
15
20
25
30
35

Stocking density



Timeline PL air-shipping (Total time 34 hours)

Packing at hatchery Global Blue Technologies, Texas USA

12 hours check-in time

10 hours flight Houston - Frankfurt

05 hours transit Frankfurt airport

01 hour flight Frankfurt - Hamburg

05 hours check-out time

01 hour car delivery Hamburg - Strande

Packout at Förde Garnelen, SH Germany

Timeline PL air-shipping in Corona times (Total time 42 hours)

Packing at hatchery Global Blue Technologies, Texas USA

15 hours check-in time

10 hours flight Dallas - Frankfurt

10 hours check-out time

07 hour car delivery Hamburg - Strande

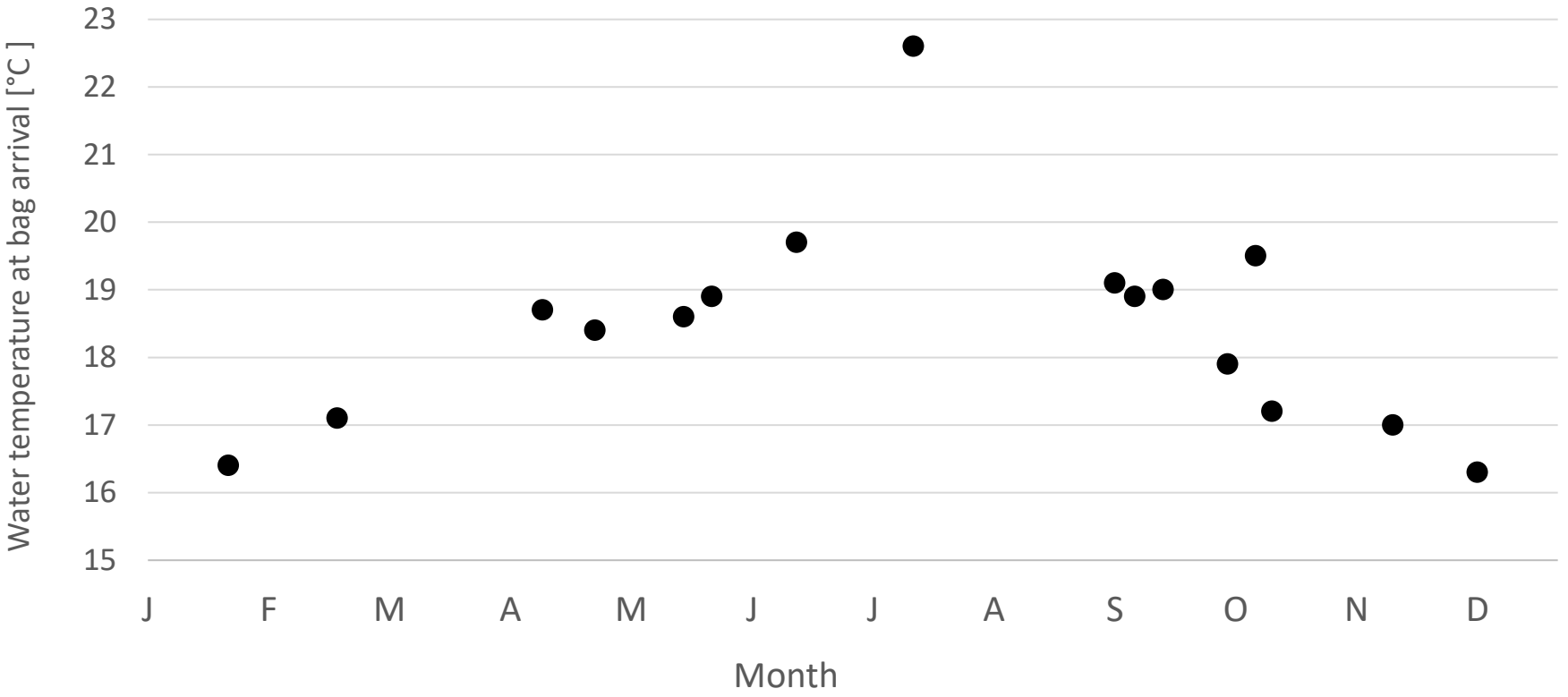
Packout at Förde Garnelen, SH Germany

Mean water parameter at bag arrival from different hatcheries

Hatchery	Origin	n	Distance		Temp.	pH	Salinity	Oxygen	TAN	NH3-N	kH	CO2
			km	h	°C		g/L	%	mg/L	mg/L	°dH	mg/L
Suburban Seafood	GER Saxonia	3	541	6	23.2	7.0	30.9	202,0	1.8	0.01	6.5	16.7
Global Blue Technology	US Texas	5	9.000	33	17.7	7.0	28.9	>265*	2.6	0.01	8.4	21.2
Amercian Penaeid	US Florida	5	9.000	33	17.7	7.0	31.0	>265*	8.6	0.03	7.4	18.6
Shrimp Improvement	US Florida	5	9.000	33	19.1	7.1	33.2	>265*	5.8	0.03	8.7	19.2
Molokai Seafarms	US Hawai	1	19.000	44	22.6	6.7	32.4	>265*	0.9	0.00	9.0	38.0

*above range of the measuring device

Seasonal relevance of bag arrival water temperature



Standard parameter for arrival, transfer, and acclimation procedure

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	Temperature	Salinity	pH	Oxygen
	°C	ppt		%
Packing US hatchery	19-23	29-33	7,7-7,9	>>100
Expected arrival at European farm	17-23	29-33	6.7-7.1	>>100
Preconditioning of dilution water	20-22	30-31	7.0-7.1	100
Acceptable difference transfer	±1-2	±1-2	+ 0.05-0.10 - 0.1-0.2	not relevant*
Acceptable acclimation 15 min shift	0.5-1.0	0.5-1.0	0.05-0.1	not relevant*

*oxygen concentration >3mg/L

Additional parameter for arrival

	Ammonia		Alkalinity		CO_2
	ppm TAN	mg N/L NH_3	°dH	mg/L $CaCO_3$	mg/L
Packing US hatchery	<0.1	0.00	7.6-8.4	136-150	2-4
Expected arrival at European farm	1-9	<0.03	6.5-9.0	116-161	17-38
Preconditioning of dilution water	<0.1	0.00	7.6-8.4*	136-150*	14-20

* values correspond to typical artificial sea salt mixtures, lower buffered mixture are an alternative to lower CO_2 value

Acclimation procedure

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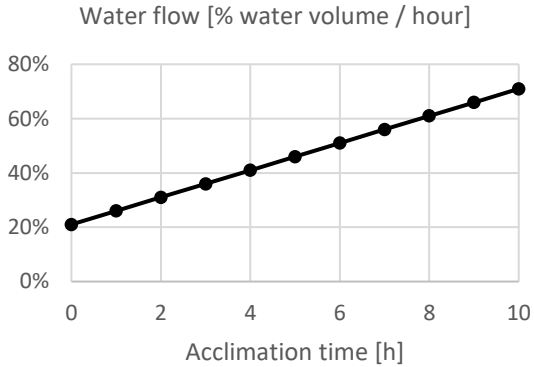
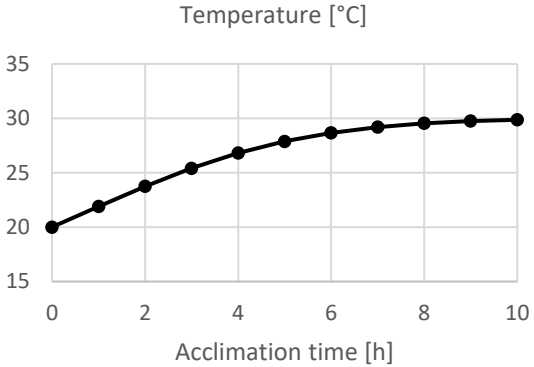
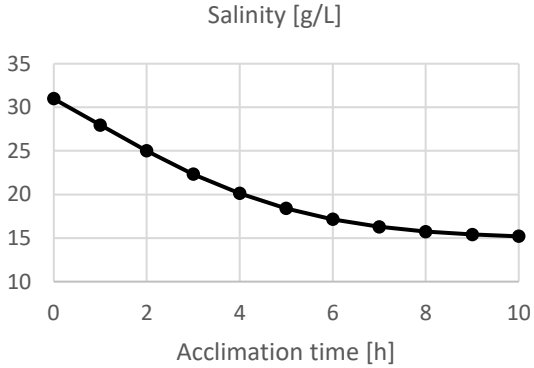
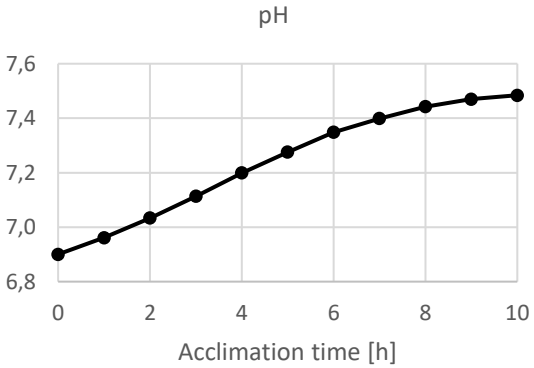
- Open cartons carefully, avoid sudden light changes
- Open a relevant number of bags to measure arrival water parameter, store water sample
- Check all bags for abnormalities as high mortalities, abnormal behavior, turbid or smelly water
- Check the dilution water for acceptable difference, set the dilution water to the right values
- Fill acclimation tank or nursery tank with dilution water, no water flow
- Transfer 1-2 bags into the prepared water and check swimming behavior
- Transfer all bags into the prepared basins
- After stocking post-larvae, set water flow to not exceed the acceptable acclimation shift
- Document all relevant water quality parameters at least every 2 hours by hand or data logger
- Take note of increasing mortalities, unusual swimming behavior and physical symptoms
- Prepare acclimation sheet for documentation

Simulation of acclimation





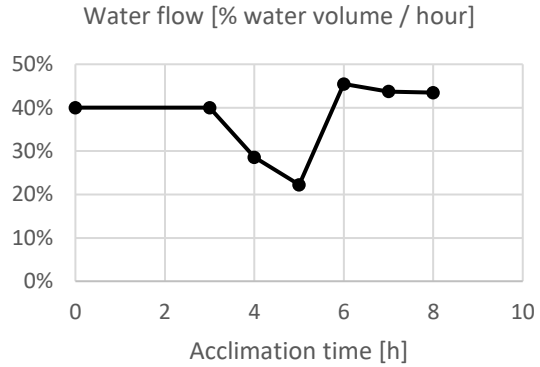


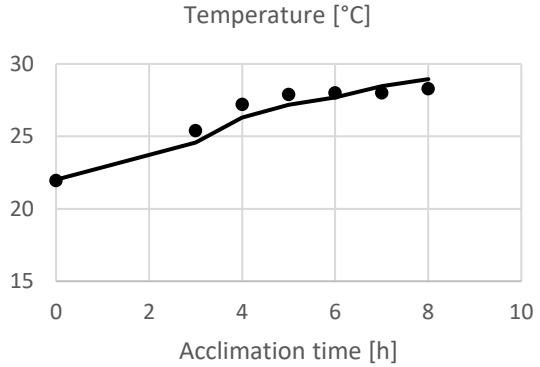


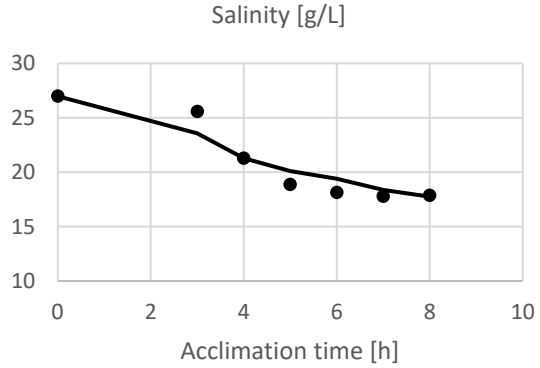
Assumed standard parameter for simulation

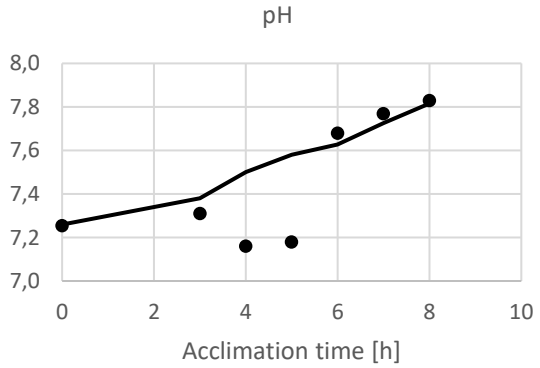
	Inflow water	Bag water
Temperature [°C]	30.0	20.0
Salinity [g/L]	15.0	31.0
pH	7.5	6.9
Alkalinity [°dH]	8.0	8.0
CO2 [mg/L]	5.8	24.1

Simulation of acclimation from a Suburban Seafood (GER) delivery









Sampled standard parameter for simulation

	Inflow water	Bag water
Temperature [°C]	29.8	22.0
Salinity [g/L]	16.6	27.0
pH	8.0	7.3
Alkalinity [°dH]	6.0	6.5
CO2 [mg/L]	1.4	8.4

Thanks for your attention.

FÖRDE GARNELEN

Acclimation guideline for *Litopenaeus vannamei* post-larvae

Dr. Bert Wecker, neomar / Förde Garnelen, bert.wecker@neomar.de

The main parameters that need to be controlled when receiving and acclimating post-larvae are temperature, salinity, oxygen, and pH value. More parameters should be controlled to establish standardized acclimation protocols, as total ammonia concentration (TAN), alkalinity, CO_2 concentration. The total ammonia concentration is important to calculate the NH_3-N concentration, the undissociated form of ammonia also known as free ammonia nitrogen (FAN), causing intoxication at elevated levels. The CO_2 concentration can be measured or also be calculated by using the values for pH, alkalinity, salinity, and temperature. Table 6 and Table 7 are showing the relation for a typical range before and during acclimation.

Table 1 is presenting an overview of different hatcheries delivering post-larvae to Förde Garnelen since 2018. Shown are the mean values of water parameter at bag arrival for maximum the last 5 shipments.

Table 1 – Mean water parameter at bag arrival from different hatcheries delivering post-larvae to Förde Garnelen.

Hatchery	Origin	Distance to farm		n	Temp.	pH	Salinity	Oxygen	TAN	NH3-N	kH	CO2
		km	h		°C		g/L	%	mg/L	mg/L	°dH	mg/L
Suburban Seafood	GER Saxonia	541	6	3	23.2	7.0	30.9	202,0	1.8	0.01	6.5	16.7
Global Blue Technol.	US Texas	9.000	33	5	17.7	7.0	28.9	>265*	2.6	0.01	8.4	21.2
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Shrimp Improvement	US Florida	9.000	33	5	19.1	7.1	33.2	>265*	5.8	0.03	8.7	19.2
Molokai Seafarms	US Hawai	19.000	44	1	22.6	6.7	32.4	>265*	0.9	0.00	9.0	38.0

**above range of the measuring device*

Temperature:
Packing water is usually chilled to 19-23°C to reduce shrimp metabolism to maintain water quality at reasonable level. Table 1 shows arrival temperatures between 17-23°C for the air shipping. Changes are related to packaging, transport time and ambient temperature. Figure 1 clearly indicates also the high seasonal relevance.

Salinity:
Salinity of packing water is usually set to 29-33 g/L. Salinity is not changing during transport.

pH:
pH of packing water is usually set to 7.7-7.9. Usually no additional buffer (as for example TRIS buffer), except the natural carbon buffer system of seawater, are used. Table 1 shows arrival pH between 6.7-7.1. The reduction is caused by the excretion of CO_2 and the accumulation in the water as the sealed plastic bags interrupt the gas transfer into the atmosphere. Usually the effect is minimized by having a large void (gas space filled with pure oxygen) above the water.

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Acclimation guideline, 10 pages